Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method of x-ray imaging a patient's breast comprising:

immobilizing the breast between a breast platform and a compression paddle, which in turn are between an x-ray source and a digital imaging receptor;

imaging the immobilized breast with x-rays from the source that pass through the breast and impinge on the receptor, from a number of different positions of the source and receptor relative to the breast, to derive image data for the respective positions;

said imaging comprising moving the receptor relative to the immobilized breast while remaining substantially parallel to the same plane and moving the source around the immobilized breast for imaging from each of said different positions; and using said image data to form images of the breast, wherein each of at least some of said images is formed from image data acquired for two or more of said different positions.

2. (Original) The method of claim 1 including maintaining a substantially constant distance from the image receptor to the breast during said imaging.

3. (Original) The method as in claim 2 including imaging the immobilized breast at a selected one of said different positions at an x-ray dose comparable to that of a conventional mammogram while the imaging at others of said different positions is at a substantially lower x-ray dose.

4. (Original) The method as in claim 3 including positioning the source at a selected one of said different positions with a center ray that is substantially perpendicular to the breast platform.

5. (Original) The method of claim 4 including providing an anti-scatter grid between the breast and receptor during said imaging.

6. (Original) The method of claim 5 including causing relative motion between the receptor and grid in the course of said imaging.

7. (Original) The method of claim 1 including maintaining a substantially constant distance between the grid and the breast during said imaging.

8. (Original) The method of claim 1 including carrying said imaging at least at some of said positions without an anti-scatter grid between the breast and the receptor.

9. (Original) The method of claim 1 including moving the source through an angle of no more than ±10° relative to the breast during said imaging

10. (Original) The method of claim 1 including moving the source through an angle of no more than ±15° relative to the breast during said imaging.

11. (Original) The method of claim 1 including moving the source through an angle of no more than ±20° relative to the breast during said imaging.

12. (Original) The method of claim 1 including moving the source through an angle of no more than ±25° relative to the breast during said imaging.

13. (Original) The method of claim 1 including moving at least the source intermittently between said different positions during said imaging.

14. (Original) The method of claim 1 including moving at least the source continuously through said different positions during said imaging.

15. (Original) The method of claim 14 including pulsing the x-ray source to emit an imaging x-ray beam intermittently while moving continuously through said different positions.

16. (Original) The method of claim 1 including rotating the source about an axis substantially coinciding with the immobilized breast during said imaging.

17. (Original) The method of claim 1 including rotating the source about an axis substantially coinciding with the image receptor during said imaging, using fiducial markers during said imaging, and using information from imaging said fiducial markers in forming at least some of said images as tomosynthetic images.

18. (Original) The method of claim 1 including restricting the receptor to a motion along a direction generally parallel to the breast platform during said imaging.

19. (Original) The method of claim 1 including providing fiducial markers at selected locations relative to the immobilized breast.

20. (Original) The method of claim 19 including providing the markers at selected locations relative to the paddle.

21. (Original) The method of claim 20 including providing the markers affixed to the paddle.

22. (Original) The method of claim 21 including integrating the markers in the paddle.

23. (Original) The method of claim 1 including using the image data to form tomosynthetic images of the breast.

24. (Original) The method of claim 23 including using fiducial markers during said imaging and using information from imaging said fiducial markers in forming said tomosynthetic images.

25. (Original) The method of claim 24 including using said information from imaging the markers for calculating positional relationships between different image data.

26. (Original) The method of claim 1 including using said image data to form tomosynthetic images of the breast.

27. (Original) The method of claim 26 including forming the images to simulate projection x-ray images of thick slices of the breast.

28. (Original) The method of claim 27 in which said images simulate projection images of breast slices that are at least 0.5 cm thick.

29. (Original) The method of claim 27 including forming said projection images to simulate images of thick slices that are generally parallel to the breast platform.

30. (Original) The method of claim 27 including displaying a number of said images of thick slices for concurrent viewing by a health professional.

31. (Original) The method of claim 30 including displaying said images of thick slices and at least one conventional mammogram of the breast for concurrent viewing by a health professional.

32. (Original) The method of claim 30 including displaying said images of thick slices and an image of the breast taken at one of said positions at x-ray dosage of a conventional mammogram during said imaging, for concurrent viewing by a health professional.

33. (Original) The method of claim 1 including using said image data to form tomosynthetic images of the breast, and displaying the tomosynthetic images for scrolling through different planes of the breast.

34. (Original) The method of claim 1 including using a Tungsten source of x-rays as said x-ray source.

35. (Original) The method of claim 1 including immobilizing the breast at pressure no more than two thirds that for a conventional mammogram.

36. (Original) The method of claim 1 including immobilizing the breast at pressure no more than half that for a conventional mammogram.

37. (Original) The method of claim 1 including applying filtered back projection to said image data to form images of selected slices of the immobilized breast, using a filter that in the frequency domain rises significantly more steeply at lower and intermediate frequencies that filters used in reconstruction of computerized tomography images.

38. (Original) The method of claim 37 including carrying said back projection in the frequency domain.

39. (Original) The method of claim 37 including carrying out said back projection in the spatial domain.

40. (Original) The method of claim 37 including using a filter that is curved at low frequencies when represented in the frequency domain.

41. (Original) The method of claim 37 using a filter that rises progressively less steeply with increase in frequency when represented in the frequency domain.

42. (Original) The method of claim 40 in which the filter is generally a high pass filter at intermediate frequencies.

43. (Original) The method of claim 37 including selectively adjusting a DC point value of the filter to differentiate between regions of said images.

44. (Original) A method of x-ray imaging a patient's breast comprising:
immobilizing the breast between a breast platform and a compression paddle, first at a first breast angle of the platform and paddle and then at a second angle of the platform and paddle;
imaging the immobilized breast with x-rays from an x-ray source that pass through the breast at each of said angles of the platform and paddle and impinge on the receptor, from a number of successive different positions of the source and

receptor relative to the breast at each of said angles of the platform and paddle, to derive image data for the respective positions;

said imaging comprising rotating the source and receptor around the immobilized breast at each of said angles of the platform and paddle; and

using said image data to form images of the breast, wherein each of at least some of said images is formed from image data acquired for two or more of said different positions.

45. (Original) A breast-imaging x-ray system comprising:

a breast platform and a compression paddle for immobilizing a patient's breast therebetween;

an x-ray source mounted for rotation about the platform and paddle, and selectively emitting a collimated x-ray beam having a center ray that is transverse to the platform;

a digital x-ray receptor mounted for selective translation relative to the breast platform, in a direction that is transverse to a length of a breast immobilized between the platform and paddle and is generally parallel to the breast platform;

said rotation of the source and selective emission of x-rays and said translation of the receptor being synchronized to image a breast immobilized between the platform and paddle at a number of different positions of the source and receptor relative to the platform and produce image data for said positions; and

a processor receiving said image data and using at least some of the data to form tomosynthetic images of a breast immobilized between the platform and paddle.

46. (Original) The system of claim 41 including a C-arm supporting the source at one end for said rotation about the platform and paddle, and the receptor at another end for said translation relative to the platform during which the receptor remains substantially parallel to the platform.

47. (Original) A method of x-ray imaging a patient's breast comprising:

immobilizing the breast between a breast platform and a compression paddle, which in turn are between an x-ray source and a digital imaging receptor;

imaging the immobilized breast with x-rays from the source that pass through the breast and impinge on the receptor, from a number of different positions of the source relative to the breast, to derive image data for the respective positions; said source moving in a continuous motion from one to another of at least three of said different positions; and

using said image data to form images of the breast, wherein each of at least some of said images is formed from image data acquired for two or more of said different positions.

48. (Original) The method of claim 47 in which the source is pulsed to emit imaging x-ray beams at said imaging positions.

49. (Original) The method of claim 47 including moving the receptor to different positions for said imaging positions of the source.

50. (Original) The method of claim 49 in which the receptor moves through said different positions while remaining at a substantially constant distance from the breast platform.

51. (Original) A method of x-ray imaging a patient's breast comprising:

immobilizing the breast between an x-ray source and a digital imaging receptor;

imaging the immobilized breast with x-rays from the source that pass through the breast and impinge on the receptor, from a number of different relative positions of the source, immobilized breast, and receptor, to derive image data for respective imaging positions;

said source moving through an angle of no more than ±30° relative to the breast through said imaging positions;

using said image data to form images of the breast, wherein each of at least some of said images is formed from image data acquired for two or more of said imaging positions; and

further processing said image data to selectively form and display further information related to one or more areas of interest in said images.

52. (Original) The method of claim 51 in which at least some of the images are thick slice tomosynthetic images.

53. (Original) The method of claim 52 in which said further information comprises images of slices that are thinner than said thick slices and relate to at least one region of interest in at least one of the thick slices.

54. (Original) The method of claim 52 in which said further information comprises positional data identifying in three dimensions a position of a suspected lesion in the immobilized breast for additional procedures involving the breast.

55. (Original) The method of claim 52 in which the further information comprises identifying and displaying a position at one or more of said slices that corresponds to a position at a selected slice of a manually controlled cursor.

56. (Original) A method of x-ray imaging a patient's breast comprising:
immobilizing the breast between an x-ray source and a digital imaging receptor;
imaging the immobilized breast with x-rays from the source that pass through the breast and impinge on the receptor, from

a number of different relative positions of the source, immobilized breast, and receptor, to derive image data for respective imaging positions;

said source moving through an angle of no more than ±30° relative to the breast through said imaging positions;

using said image data to form images of the breast, wherein each of at least some of said images is formed from image data acquired for two or more of said imaging positions; and

displaying at least some of said images concurrently at a display manually controlled to display images representing slices of the breast that have selected thicknesses.

57. (New) A method of imaging a patient's breast with x-rays using a flat panel digital x-ray imager to obtain both two dimensional (2D) image data for a conventional mammogram data and three-dimensional (3D) image data for tomosynthesis images in a single breast compression, using an anti-scatter grid in obtaining some but not all the image data, comprising:

immobilizing a patient's breast between an x-ray source and a flat panel digital x-ray imager;

energizing the x-ray source to emit x-rays at each of a

plurality of different angular positions of the source relative to the breast while the breast remains immobilized, and concurrently using the imager to derive x-ray projection image data for the respective positions;

wherein the image data for at least one of said positions, called hereafter a mammogram position, are taken at a view matching that of a conventional CC and/or MLO view used in conventional mammography, and the image data for a plurality of other positions, called hereafter tomosynthesis positions, are taken at other relative angles of the source and breast;

using an anti-scatter grid between the patient's breast an the imager for at least the mammogram positions but not for at least some of the tomosynthesis positions; and

processing the image data taken for the mammogram position to form and display a mammogram and using the image data taken for said tomosynthesis positions to form and display tomosynthesis images of the breast.

58. (New) A method as in claim 57 in which the image data for the mammogram position are taken at a patient x-ray dose comparable to that used in conventional mammography but the image data for each of the tomosynthesis positions are taken at a substantially lower dose.

59. (New) A method as in claim 57 in which the step of energizing the x-ray source at different angular positions comprises energizing the source intermittently during a continuous movement thereof relative to the breast covering at least some said positions.

60. (New) A method as in claim 59 in which the energizing step further includes energizing the source while stationary relative to the breast for at least one of said positions.

61. (New) A method as in claim 57 in which the image data for the mammogram position are acquired when the source is stationary relative to the breast.

62. (New) A method as in claim 57 in which the step of

energizing the x-ray source at different angular positions comprises keeping the source stationary relative to the breast at a number of said positions.

63. (New) A method as in claim 57 in which at least some of the tomosynthesis images conform to image planes that are generally parallel to that of the mammogram.

64. (New) A method as in claim 57 in which at least some of the tomosynthesis images conform to image plane that are non-parallel to that of the mammogram.

65. (New) A method as in claim 57 in which the source at said mammogram position is at an angle of substantially 0° relative to the breast.

66. (New) A method as in claim 57 in which the image data for said mammogram position are taken before the image data for the tomosynthesis positions.

67. (New) A method as in claim 57 in which the image data

for the mammogram position is taken after the image data for the tomosynthesis positions.

68. (New) A method as in claim 57 in which the image data for the mammogram position are taken after the image data for some of the tomosynthesis positions but before the image data for other tomosynthesis positions.

69. (New) A method as in claim 57 in which the image data for each of the tomosynthesis positions are acquired with the use of substantially higher x-ray source kV compared with the kV used for a conventional mammogram

70. (New) A method as in claim 57 in which the image data are acquired with x-rays emitted from a Tungsten x-ray target.

71. (New) A method as in claim 57 in which at least some of the image data are acquired with x-rays at a kVp range substantially higher than 25 kVp.

72. (New) A method as in claim 57 in which at least some of

the image data are acquired with x-ray in a range up to 50 kVp.

73. (New) A method as in claim 57 in which said angular positions extend over a range of no more than 60°.

74. (New) A method as in claim 57 including displaying the mammogram and tomosynthesis images for concurrent viewing.

75. (New) A method as in claim 57 including displaying the mammogram and tomosynthesis images on the same screen.

76. (New) A method as in claim 57 including displaying the mammogram and tomosynthesis images on adjacent screens.

77. (New) A method as in claim 57 in which the tomosynthesis images represent thin slices of the breast that are essentially planar sections through the breast.

78. (New) A method as in claim 57 in which the tomosynthesis images represent thick slices of the breast, about 5 to about

10 mm thick.

79. (New) A combination mammogram/tomosynthesis system comprising:

an x-ray source, a flat panel digital x-ray imager, and a breast support immobilizing a patient's breast between the source and the imager;

a source support selectively moving the source relative to the breast support between different angular positions of the source relative to the breast support;

a control selectively energizing the source to emit x-rays through the breast support to the imager, while a patient's breast remains immobilized in the breast support; at each of said different angular positions;

wherein at least one of said angular positions is a mammogram position that is the same or similar to a position for a conventional mammogram but others of said positions are tomosynthesis positions that are different from conventional mammogram positions;

an anti-scatter grid selectively movable in the path of said x-rays from the breast to the imager, said grid being in said

path for the mammogram position but being out of said path for at least some of the tomosynthesis positions; and

a processor using an output of said imager for said mammogram and tomosynthesis positions of the source relative to the immobilized breast to form at least one mammogram image and tomosynthesis images of the breast.

80. (New) A system as in claim 79 in which the control energizes the source to emit a patient x-ray dose for the mammogram position comparable to that used in conventional mammography but to emit patient x-ray doses for each of the tomosynthesis positions that are substantially lower.

81. (New) A system as in claim 79 in which the control energizes the x-ray source at different angular positions intermittently during a continuous movement of the source relative to the breast covering at least some said positions.

82. (New) A system as in claim 79 in which the control energizes the source while the source is stationary relative to the breast for at least one of said positions.

83. (New) A system as in claim 79 in which the control energizes the source for the mammogram position when the source is stationary relative to the breast.

84. (New) A system as in claim 79 in which the control energizes the x-ray source at different angular positions relative to the breast when the source is stationary relative to the breast at each of a number of said positions.

85. (New) A system as in claim 79 in which the processor forms at least some of the tomosynthesis images to conform to image planes that are generally parallel to that of the mammogram.

86. (New) A system as in claim 79 in which the processor forms at least some of the tomosynthesis images to conform to image plane that are non-parallel to that of the mammogram.

87. (New) A system as in claim 79 in which the control places the source at said mammogram position at an angle of

substantially 0° relative to the breast.

88. (New) A system as in claim 79 in which the control places the source for taking image data for said mammogram position before taking image data for the tomosynthesis positions.

89. (New) A system as in claim 79 in which the control places the source for taking image data for the mammogram position after taking image data for the tomosynthesis positions.

90. (New) A system as in claim 79 in which the control places the source for taking image data for the mammogram position after taking image data for some of the tomosynthesis positions but before taking image data for other tomosynthesis positions.

91. (New) A system as in claim 79 in which the control energizes the source for taking image data for each of the tomosynthesis positions at substantially higher x-ray source

kV compared with the kV used for a conventional mammogram

92. (New) A system as in claim 79 in which the source comprises a Tungsten x-ray target emitting x-rays toward said imager.

93. (New) A system as in claim 79 in which at the source emits x-rays at a kVp range substantially higher than 25 kVp when the imager is acquiring image data at least at some of said positions.

94. (New) A system as in claim 79 in which the source emits x-ray in a range up to 50 kVp when the imager is acquiring image data for at least some said positions.

95. (New) A system as in claim 79 in which the control moves the source through angular positions that extend over a range of no more than 60°.

96. (New) A system as in claim 79 including at least one display displaying the mammogram and tomosynthesis images for

concurrent viewing.

97. (New) A system as in claim 79 including at least one display displaying the mammogram and tomosynthesis images on the same screen.

98. (New) A system as in claim 79 including at least one display displaying the mammogram and tomosynthesis images on adjacent screens.

99. (New) A system as in claim 79 in which the processor forms tomosynthesis images that represent thin slices of the breast that are essentially planar sections through the breast.

100. (New) A system as in claim 79 in which the processor forms tomosynthesis images that represent thick slices of the breast, about 5 to about 10 mm thick.

101. (New) A combo x-ray system acquiring 2D and 3D images of the breast in a single compression, comprising: an x-ray

source, a flat panel digital x-ray imager, and a breast support and a compression paddle between the source and the imager, said compression paddle being comparable in size to the imager and being selectively movable laterally relative to the imager along the patient's chest wall, thereby selectively compressing the breast off-center relative to the imager;

a motion control moving the source relative to a patient's breast while the breast remains immobilized in compression between the breast support and the compression paddle, and selectively energizing the source to emit x-rays through the breast to the imager at selected angular positions of the source relative to the breast;

a processor controlling the imager to derive therefrom image data when the source is energized at each of said positions, and processing the image data into images, wherein at least one of said images is a projection mammogram image comparable to a conventional mammogram and at least some of the images are reconstructed tomosynthesis images conforming to planes that are selectively the same or different from that of the mammogram; and

a display displaying said mammogram and tomosynthesis images

selectively side by side or superimposed.

102. (New) A system as in claim 101 in which said display displays the mammogram and tomosynthesis images on the same screen.

103. (New) A system as in claim 101 including an anti-scatter grid and a grid support selectively placing the grid in the path of x-rays from the breast to the imager and out of said path.

104. (New) A system as in claim 101 in which the grid support places the grid in said path while the imager is providing image data for the mammogram image but out of said path when the imager is providing image data for at least some of the tomosynthesis images.

105. (New) A system for acquiring and displaying 2D and 3D breast x-ray images in combination, comprising:

a breast support and an x-ray source at one side of the breast support and a flat panel x-ray images at the other side

of the breast support;

a control moving the source relative to a compressed patient's breast on the breast platform and selectively energizing the source to emit x-rays through the breast to the images in the course of the source movement and selectively causing the imager to output image data for positions at which the source is energized, thereby causing the imager to acquire 2D mammogram image data and 3D tomosynthesis image data;

a processor processing the imager output and thereby forming at least one 2D mammogram image and a number of 3D tomosynthesis images conforming to selected planes through the breast; and

a display displaying in combination and concurrently both the at least one mammogram image and at least one tomosynthesis image.

106. (New) A system taking x-ray mammogram images and tomosynthesis images of a patient's breast using the same equipment, comprising:

an x-ray source, a flat panel x-ray imager and a breast support between the source and the imager;

a source support selectively moving the source relative to the breast support;

a control selectively energizing the source in a mammogram position thereof relative to the breast support and causing the imager to provide image data for a mammogram of a breast on the breast support, and selectively energizing the source at tomosynthesis positions thereof relative to the breast support and causing the imager to provide image data for tomosynthesis images of a breast on the breast support;

a processor selectively processing the mammogram image data to form at least one screening mammogram image and selectively processing the tomosynthesis data to form a number of diagnostic tomosynthesis images; and

a display selectively displaying said screening mammogram image and/or a number of said tomosynthesis images.

107. (New) A system as in claim 106 in which the mammogram images are screening mammogram images and the tomosynthesis images are diagnostic tomosynthesis images.

108. (New) A system as in claim 107 in which the

tomosynthesis images are screening tomosynthesis images and the mammogram images are diagnostic mammogram images.

109. (New) A system as in claim 106 in which the display displays both at least one of the mammogram images and at least several of the tomosynthesis images concurrently.

110. (New) A system as in claim 106 in which the image data for the mammogram and tomosynthesis positions is acquired during a single compression of a patient's breast.

111. (New) A single combo system selectively taking a mammogram image or tomosynthesis images of a patient's breast, comprising:

an x-ray source, a flat panel x-ray imager and a breast support between the source and the imager;

a source support selectively moving the source relative to the breast;

a control selectively energizing the source in at least one mammogram position thereof relative to the breast support and causing the imager to provide mammogram image data for at

least one mammogram of a patient's breast on the breast platform, or at tomosynthesis positions thereof relative to the breast support and causing the imager to provide tomosynthesis image data for tomosynthesis images of a breast on the breast support;

a processor selectively processing the mammogram image data to form at least one mammogram or the tomosynthesis data to form a number of tomosynthesis images; and

a display selectively displaying said screening mammogram or a number of said tomosynthesis images or previously taken mammogram or tomosynthesis images.

112. (New) A system as in claim 111 in which the mammogram images are screening mammogram images and the tomosynthesis images are diagnostic tomosynthesis images.

113. (New) A system as in claim 111 in which the tomosynthesis images are screening tomosynthesis images and the mammogram images are diagnostic mammogram images.

114. (New) A system as in claim 111 in which the display

displays both at least one of the mammogram images and at least several of the tomosynthesis images concurrently.

115. (New) A system as in claim 111 in which the image data for the mammogram and tomosynthesis positions is acquired during a single compression of a patient's breast.

116. (New) A method of taking a mammogram image and/or tomosynthesis images using the same equipment and selectively displaying the mammogram and/or tomosynthesis images on the same display, comprising;

providing an x-ray source that selectively moves relative to a patient's breast while the breast remains compressed, and a flat panel x-ray imager receiving x-rays from the source through the breast when the source is energized;

selectively placing the source in at least one mammogram position relative to the breast or in tomosynthesis positions relative to the breast, and selectively energizing the source in at least one of said positions and extracting image data from the imager in response to x-rays from the source impinging thereon after passing through the breast;

processing the image data extracted from the imager to form at least one mammogram image or a number of tomosynthesis images; and

selectively displaying the image or images formed by the processor.

117. (New) A method as in claim 116 in which the displaying comprises displaying both mammogram and tomosynthesis images side-by-side or superimposed.

118. (New) A method as in claim 116 in which the displaying comprises displaying at the same time and side-by-side or superimposed both tomosynthesis images acquired with said equipment and at least one previously acquired mammogram image.

119. (New) A system as in claim 111 in which the mammogram images are diagnostic mammogram
images and the tomosynthesis images are diagnostic tomosynthesis images.

120. (New) A system as in claim 111 in which the tomosynthesis images are screening tomosynthesis images and the mammogram images are screening mammogram images.

121. (New) A system as in claim 106 in which the mammogram images are diagnostic mammogram images and the tomosynthesis images are diagnostic tomosynthesis images.

122. (New) A system as in claim 107 in which the tomosynthesis images are screening tomosynthesis images and the mammogram images are screening mammogram images.